What is claimed is:

1. A scalable optical interconnect capable of transparent optical switching at switching speeds of less than one microsecond along all of at least two orthogonal switching dimensions.

2. The scalable optical interconnect of claim 1 capable of transparent optical switching at switching speeds of less than ten nanoseconds along all of at least two orthogonal switching dimensions.

3. The scalable optical interconnect of claim 2 capable of transparent optical switching at switching speeds of less than 100 picoseconds along all of at least two orthogonal switching dimensions.

4. The scalable optical interconnect of claim 1 capable of transparent optical switching at switching speeds of less than one microsecond along all of at least three orthogonal switching dimensions.

5. The scalable optical interconnect of claim 2 capable of transparent optical switching at switching speeds of less than ten nanoseconds along all of at least three orthogonal switching dimensions.

6. The scalable optical interconnect of claim 3 capable of transparent optical switching at switching speeds of less than 100 picoseconds along all of at least three orthogonal switching dimensions.

7. The scalable optical interconnect of claim 2 capable of transparent optical switching at switching speeds of less than ten nanoseconds along all of at least four orthogonal switching dimensions.

8. A scalable optical interconnect capable of independently transparently optically switching, at speeds of less than ten nanoseconds, from among channels distributed across space and wavelength domains.

9. The scalable optical interconnect of claim 8 capable of independently transparently optically switching, at speeds of less than ten nanoseconds, from among channels distributed across space, wavelength, and waveband domains.

10. The scalable optical interconnect of claim 8 capable of independently transparently optically switching, at speeds of less than ten nanoseconds, from among channels distributed across space, wavelength, and polarization domains.

11. The scalable optical interconnect of claim 8 capable of independently transparently optically switching, at speeds of less than ten nanoseconds, from among channels distributed across space, wavelength, waveband, and polarization domains.

12. The scalable optical interconnect of claim 8 capable of independently transparently optically switching, at speeds of less than ten nanoseconds, from among channels distributed across space, wavelength, and time domains.

13. An scalable optical interconnect comprising:

a plurality of transmitters;

a multiplexing subsystem structured and arranged so as to be able to combine the signals of the plurality of transmitters onto one or more transport fibers according to an orthogonal multiplexing scheme;

broadband burst-mode receivers structured and arranged so as to be capable of receiving any signal from any one transmitter of the plurality of transmitters;

a distribution subsystem structured and arranged so as to be able to distribute independently and contemporaneously the signals of every transmitter to every receiver; and

one or more selection subsystems structured and arranged so as to be capable of selecting, in less than 1 microsecond, a single channel from within the orthogonal multiplexing scheme.

14. An scalable optical interconnect comprising:

a plurality of local transmitters;

a bit clock providing a bit clock signal to the plurality of transmitters;

a 10-nanosecond or faster switch for selecting among said plurality of transmitters; and

burst-mode receivers structured and arranged so as to receive bursts of data from said local transmitters through said switch,

whereby the burst-mode receivers need only acquire a bit phase associated with each burst of data, and not a bit frequency, not a bit frequency and a bit phase together.

15. A distributed scalable contention resolution and resource scheduling subsystem comprising:

a plurality of input control channels;

a plurality of output control channels;

a plurality of logical processes distributed over one or more processors;

a first process of said logical processes dedicated to resolving contentions among signals from transmitters contending for a first subset of shared resources;

a second process of said logical processes dedicated to resolving contentions among signals from transmitters contending for a second subset of shared resources within an optical interconnect, based in part on output from said first process; and

wherein the first subset and the second subset are independently multiplexible and selectable.

16. A method of contention resolution and resource scheduling within an optical interconnect, the method comprising the steps of:

resolving contentions among signals from transmitters contending for a first subset of shared resources within an optical interconnect;

resolving contentions among signals from transmitters contending for a second subset of shared resources within an optical interconnect, based in part on the result of resolving contentions among signals from transmitters contending for the first subset;

wherein the first subset and the second subset are independently multiplexible and selectable.